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04. Botany

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Abstracts from the 2016 Oklahoma Research Day

Held at Northeastern State University

05. Mathematics and Science

04. Botany

05.04.01 Review of “Sub1A is an ethylene-response-factor-like gene that confers submergence tolerance to rice”

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Wang,Kevin *Northeastern State University*

When crops of *Oryza sativa* are completely submerged under water, most of the cultivars in the crops planted in China die out within a few days to a week. This has cost the rice industry in China over a billion US dollars every year. There are a few cultivars that can handle being completely submerged under water for up to two weeks and still survive, one example being *O. sativa* ssp. *indica* FR13A. This submergence resistance stems from a locus referred to as Submergence 1 (Sub1) found on chromosome 9. There are a group of 3 genes in this locus that contain ethylene response factors. They refer to them as Sub1A, Sub1B, and Sub1C, and while Sub1B and Sub1C were found in all rice cultivars that were analyzed, Sub1A was not always found. A survey was done finding there are also two alleles for Sub1A, a tolerance-specific allele and an intolerance-specific allele referred to as Sub1A-1 and Sub1A-2, respectively. Marker-assisted selection was then used to insert the Sub1 locus from the FR13A into a commonly used strain of rice used in Asia that is known for producing a high yield of rice and a pleasant taste, among other qualities. The goal of this is to produce a cultivar of rice that would be resistant to flooding and saving the rice industry time and money.

05.04.02 Floristic Quality Versus Taxonomic Distinctness for Wetland Condition Assessment

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Indices of floristic quality and taxonomic distinctness are potentially useful for site monitoring and evaluation. Floristic quality assessment is based on species tolerance to anthropogenic disturbance, whereas taxonomic distinctness is based on the degree of species relatedness. Floristic quality assessment is well established whereas the taxonomic distinctness assessment has not, to our knowledge, been tested for wetland vegetation in North America. Our objective was to determine which approach, floristic quality (FQ) or taxonomic distinctness (TD), provides a better indicator of general wetland condition. We compared FQ indices and TD indices using 108 non-forested wetlands in Oklahoma and analyzed all indices with respect to disturbance categories and a disturbance gradient using randomization tests and linear mixed models. In the categorical analysis, FQ indices differentiated minimally altered wetlands from intermediate and highly altered, whereas TD indices differentiated highly altered wetlands from intermediate and minimally altered. In the gradient analysis, both approaches showed a weak to moderate relationship with disturbance after controlling for natural environmental factors (ecoregion, precipitation, etc.). These results suggest that (1) both approaches (FQ and TD) may be needed to assess the full range of wetland condition, and (2) gradient-based condition assessments may be difficult (at least in Oklahoma) unless background environmental factors are account

05.04.03 Localization and Structure of Plastidial-Encoded Polymerase Sub-units

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Chloroplast biogenesis is a quintessential process within the realm of plant biology. The path towards chloroplast biogenesis begins with the inhibition of skotomorphogenesis, followed by photomorphogenesis through red light sensing ultimately leading to the initiation of chloroplast biogenesis. We have observed that plants do not develop properly and show an albino phenotype (lacking chloroplast) when chloroplast biogenesis does not occur. Previous experiments have shown that a complex dubbed Plastid Encoded Polymerase (PEP) interacting with Polymerase Associated Proteins (PAP) is the major player in setting a functional chloroplast. Given the semi-autonomous nature of the chloroplast genome, it is established that a cross-talk must occur with the nuclear genome. The white phenotype is observed with the genetic excision of any single PAP, indicating that the whole complex is no longer able to form or function. Interestingly both a chloroplastic-transit peptide and a nuclear localization signal have been predicted within the sequences of certain PAP proteins. To validate these predictions and gain insight on the role of selected PAP proteins within the messaging system, I have chosen to pursue the subcellular localization and protein-protein interactions of these essential proteins. Moreover structural characterization will help us understand the function of each of these proteins within the PEP/PAP complex.